WHAT IS CLAIMED IS:

1. An optical information processor performing at least one of information recording and information reproduction with respect to an information recording medium, comprising:

a light source;

an objective lens for focusing light emitted from the light source on the information recording medium;

a separation element for separating light from the information recording medium from an optical path to the light source; and

first photodetectors for receiving light separated by the separation element,

wherein an aperture NA1 in a first optical path from the light source to the information recording medium and an aperture NA2 in a second optical path from the information recording medium to the first photodetectors are formed so as to satisfy a relationship of

$NA1 > NA2$.

2. The optical information processor according to claim 1,

wherein the aperture NA1 in the first optical path and the aperture NA2 in the second optical path satisfy a relationship of

$1 < NA1 / NA2 < 1.2$.

3. The optical information processor according to claim 1,

wherein the aperture NA1 in the first optical path is formed in a circular shape.

4. The optical information processor according to claim 1,

wherein the aperture in the second optical path is formed of an aperture element comprising a diffraction grating and a $\lambda/4$ plate.

5. The optical information processor according to claim 1,

wherein the separation element is formed of a hologram.

6. The optical information processor according to claim 1,

wherein the aperture in the second optical path is formed of an aperture element provided with a diffraction grating, the separation element is formed of a hologram, and the aperture element and the separation element are combined to form one component .

7. The optical information processor according to claim 1,

wherein the light source and the first photodetectors are combined

to form one component.

8. The optical information processor according to claim 1, wherein the objective lens and the aperture element are combined to form one component.

9. The optical information processor according to claim 1, wherein the aperture in the second optical path is formed to be variable.

10. The optical information processor according to claim 1, wherein the aperture in the second optical path is formed of an aperture element comprising a $\lambda/4$ plate and a liquid crystal element, and the optical information processor further comprises a driving circuit for the liquid crystal element.

11. The optical information processor according to claim 1, wherein the aperture in the second optical path is formed of an aperture element provided with a liquid crystal element, the optical information processor further comprises a driving circuit for the liquid crystal element and a switching circuit for switching the driving circuit, and the aperture of the aperture element is varied by the switching circuit depending on the information recording medium.

12. The optical information processor according to claim 1, wherein the aperture in the second optical path is formed of an aperture element comprising a polarization hologram portion and a thin film structure, the polarization hologram portion is formed by sandwiching a diffraction grating made of a birefringent material and a wave film having an optical thickness of $(N + 1/4)\ \lambda 1$ (wherein N indicates an arbitrary natural number) between two glass substrates, the thin film structure is attached to either one of the glass substrates and varies an aperture area respectively for two lights with wavelengths $\lambda 1$ and $\lambda 2$ ($\lambda 1 < \lambda 2$) passing through the aperture element.

13. The optical information processor according to claim 12, wherein the other glass substrate, to which the thin film structure is not attached, of the two glass substrates (with a refractive index ng) is provided with a structure having a plurality of concentric stepped portions in which difference in height between adjacent stepped portions is $\lambda 1 / (ng - 1)$.

14. The optical information processor according to claim 12, wherein the wavelengths $\lambda 1$ and $\lambda 2$ of two kinds of lights passing

through the aperture element satisfy a relationship of $(N1 + 1/4)\ \lambda 1 \fallingdotseq N2 \times \lambda 2$, wherein N1 and N2 represent arbitrary natural numbers.

15. The optical information processor according to claim 1,

wherein the aperture in the second optical path is formed of an aperture element comprising a polarization hologram portion and a thin film structure, the polarization hologram portion is formed by sandwiching a diffraction grating made of a birefringent material and a wave film having an optical thickness of $(N + 1/5)\ \lambda 1$ (wherein N indicates an arbitrary natural number) between two glass substrates, the thin film structure is attached to either one of the glass substrates and varies an aperture area respectively for two lights with wavelengths $\lambda 1$ and $\lambda 2$ ($\lambda 1 < \lambda 2$) passing through the aperture element.

16. The optical information processor according to claim 15,

wherein the other glass substrate, to which the thin film structure is not attached, of the two glass substrates (with a refractive index ng) is provided with a structure having a plurality of concentric stepped portions in which difference in height between adjacent stepped portions is $\lambda 1 / (ng - 1)$.

17. The optical information processor according to claim 15,

wherein the wavelengths $\lambda 1$ and $\lambda 2$ of two kinds of lights passing through the aperture element satisfy a relationship of $(N1 + 1/5)\ \lambda 1 \fallingdotseq N2 \times \lambda 2$, wherein N1 and N2 represent arbitrary natural numbers.

18. An optical information processor performing at least either one of information recording and information reproduction with respect to an information recording medium, comprising:

a light source;

an objective lens for focusing light emitted from the light source on the information recording medium;

a separation element for separating light from the information recording medium from an optical path to the light source; and

first photodetectors for receiving light separated by the separation element,

wherein an aperture in a direction almost orthogonal to a track of data string on the information recording medium is formed so that an aperture NA1(R) in a first optical path from the light source to the information recording medium and an aperture NA2(R) in a second optical path from the information recording medium to the first photodetectors

satisfy a relationship of NA1(R) > NA2(R), and an aperture in a direction almost parallel to the track of data string on the information recording medium is formed so that an aperture NA1(T) in the first optical path and an aperture NA2(T) in the second optical path satisfy a relationship of NA1(T) = NA2(T).

19. The optical information processor according to claim 18,

wherein the aperture in the direction almost orthogonal to the track of data string on the information recording medium satisfies a relationship of $1 < NA1(R) / NA2(R) < 1.2$.

20. The optical information processor according to claim 18,

wherein the aperture in the second optical path is formed of an aperture element comprising a diffraction grating and a $\lambda/4$ plate.

21. The optical information processor according to claim 18,

wherein the separation element is formed of a hologram.

22. The optical information processor according to claim 18,

wherein the aperture in the second optical path is formed of an aperture element provided with a diffraction grating, the separation element is formed of a hologram, and the aperture element and the separation element are combined to form one component.

23. The optical information processor according to claim 18,

wherein the light source and the first photodetectors are combined to form one component.

24. The optical information processor according to claim 18,

wherein the objective lens and the aperture element are combined to form one component.

25. The optical information processor according to claim 18,

wherein the aperture in the second optical path is formed to be variable.

26. The optical information processor according to claim 18,

wherein the aperture in the second optical path is formed of an aperture element comprising a $\lambda/4$ plate and a liquid crystal element, and the optical information processor further comprises a driving circuit for the liquid crystal element.

27. The optical information processor according to claim 18,

wherein the aperture in the second optical path is formed of an aperture element provided with a liquid crystal element, the optical

information processor further comprises a driving circuit for the liquid crystal element and a switching circuit for switching the driving circuit, and the aperture of the aperture element is varied by the switching circuit depending on the information recording medium.

28. The optical information processor according to claim 18, wherein the aperture in the second optical path is formed of an aperture element comprising a polarization hologram portion and a thin film structure, the polarization hologram portion is formed by sandwiching a diffraction grating made of a birefringent material and a wave film having an optical thickness of $(N + 1/4)\ \lambda 1$ (wherein N indicates an arbitrary natural number) between two glass substrates, the thin film structure is attached to either one of the glass substrates and varies an aperture area respectively for two lights with wavelengths $\lambda 1$ and $\lambda 2$ ($\lambda 1 < \lambda 2$) passing through the aperture element.

29. The optical information processor according to claim 28, wherein the other glass substrate, to which the thin film structure is not attached, of the two glass substrates (with a refractive index ng) is provided with a structure having a plurality of concentric stepped portions in which difference in height between adjacent stepped portions is $\lambda 1 / (ng - 1)$.

30. The optical information processor according to claim 28, wherein the wavelengths $\lambda 1$ and $\lambda 2$ of two kinds of lights passing through the aperture element satisfy a relationship of $(N1 + 1/4)\ \lambda 1 \doteqdot N2 \times \lambda 2$, wherein N1 and N2 represent arbitrary natural numbers.

31. The optical information processor according to claim 18, wherein the aperture in the second optical path is formed of an aperture element comprising a polarization hologram portion and a thin film structure, the polarization hologram portion is formed by sandwiching a diffraction grating made of a birefringent material and a wave film having an optical thickness of $(N + 1/5)\ \lambda 1$ (wherein N indicates an arbitrary natural number) between two glass substrates, the thin film structure is attached to either one of the glass substrates and varies an aperture area respectively for two lights with wavelengths $\lambda 1$ and $\lambda 2$ ($\lambda 1 < \lambda 2$) passing through the aperture element.

32. The optical information processor according to claim 31, wherein the other glass substrate, to which the thin film structure is not attached, of the two glass substrates (with a refractive index ng) is

provided with a structure having a plurality of concentric stepped portions in which difference in height between adjacent stepped portions is $\lambda 1 / (ng - 1)$.

33. The optical information processor according to claim 31,

wherein the wavelengths $\lambda 1$ and $\lambda 2$ of two kinds of lights passing through the aperture element satisfy a relationship of $(N1 + 1/5)\lambda 1 \fallingdotseq N2 \times \lambda 2$, wherein N1 and N2 represent arbitrary natural numbers.

34. An optical information processor performing at least either one of information recording and information reproduction with respect to an information recording medium, comprising:

a light source;

an objective lens for focusing light emitted from the light source on the information recording medium;

a separation element for separating light from the information recording medium from an optical path to the light source; and

first photodetectors for receiving light separated by the separation element,

wherein an aperture in a direction almost parallel to a track of data string on the information recording medium is formed so that an aperture NA1(T) in a first optical path from the light source to the information recording medium and an aperture NA2(T) in a second optical path from the information recording medium to the first photodetectors satisfy a relationship of NA1(T) > NA2(T), and an aperture in a direction almost orthogonal to the track of data string on the information recording medium is formed so that an aperture NA1(R) in the first optical path and an aperture NA2(R) in the second optical path satisfy a relationship of NA1(R) = NA2(R).

35. The optical information processor according to claim 34,

wherein the aperture in the direction almost parallel to the track of data string on the information recording medium satisfies a relationship of $1 < NA1(T) / NA2(T) < 1.2$.

36. The optical information processor according to claim 34,

wherein the aperture in the second optical path is formed of an aperture element comprising a diffraction grating and a $\lambda/4$ plate.

37. The optical information processor according to claim 34,

wherein the separation element is formed of a hologram.

38. The optical information processor according to claim 34,

wherein the aperture in the second optical path is formed of an aperture element provided with a diffraction grating, the separation element is formed of a hologram, and the aperture element and the separation element are combined to form one component .

39. The optical information processor according to claim 34,

wherein the light source and the first photodetectors are combined to form one component.

40. The optical information processor according to claim 34,

wherein the objective lens and the aperture element are combined to form one component.

41. The optical information processor according to claim 34,

wherein the aperture in the second optical path is formed to be variable.

42. The optical information processor according to claim 34,

wherein the aperture in the second optical path is formed of an aperture element comprising a $\lambda/4$ plate and a liquid crystal element, and the optical information processor further comprises a driving circuit for the liquid crystal element.

43. The optical information processor according to claim 34,

wherein the aperture in the second optical path is formed of an aperture element provided with a liquid crystal element, the optical information processor further comprises a driving circuit for the liquid crystal element and a switching circuit for switching the driving circuit, and the aperture of the aperture element is varied by the switching circuit depending on the information recording medium.

44. The optical information processor according to claim 34,

wherein the aperture in the second optical path is formed of an aperture element comprising a polarization hologram portion and a thin film structure, the polarization hologram portion is formed by sandwiching a diffraction grating made of a birefringent material and a wave film having an optical thickness of $(N + 1/4)\ \lambda 1$ (wherein N indicates an arbitrary natural number) between two glass substrates, the thin film structure is attached to either one of the glass substrates and varies an aperture area respectively for two lights with wavelengths $\lambda 1$ and $\lambda 2$ ($\lambda 1 < \lambda 2$) passing through the aperture element.

45. The optical information processor according to claim 44,

wherein the other glass substrate, to which the thin film structure is not attached, of the two glass substrates (with a refractive index ng) is provided with a structure having a plurality of concentric stepped portions in which difference in height between adjacent stepped portions is $\lambda 1 / (ng - 1)$.

46. The optical information processor according to claim 44,

wherein the wavelengths $\lambda 1$ and $\lambda 2$ of two kinds of lights passing through the aperture element satisfy a relationship of $(N1 + 1/4)\ \lambda 1 \doteqdot N2 \times \lambda 2$, wherein N1 and N2 represent arbitrary natural numbers.

47. The optical information processor according to claim 34,

wherein the aperture in the second optical path is formed of an aperture element comprising a polarization hologram portion and a thin film structure, the polarization hologram portion is formed by sandwiching a diffraction grating made of a birefringent material and a wave film having an optical thickness of $(N + 1/5)\ \lambda 1$ (wherein N indicates an arbitrary natural number) between two glass substrates, the thin film structure is attached to either one of the glass substrates and varies an aperture area respectively for two lights with wavelengths $\lambda 1$ and $\lambda 2$ ($\lambda 1 < \lambda 2$) passing through the aperture element.

48. The optical information processor according to claim 47,

wherein the other glass substrate, to which the thin film structure is not attached, of the two glass substrates (with a refractive index ng) is provided with a structure having a plurality of concentric stepped portions in which difference in height between adjacent stepped portions is $\lambda 1 / (ng - 1)$.

49. The optical information processor according to claim 47,

wherein the wavelengths $\lambda 1$ and $\lambda 2$ of two kinds of lights passing through the aperture element satisfy a relationship of $(N1 + 1/5)\ \lambda 1 \doteqdot N2 \times \lambda 2$, wherein N1 and N2 represent arbitrary natural numbers.

50. An optical information processor performing at least either one of information recording and information reproduction with respect to an information recording medium, comprising:

a light source;

an objective lens for focusing light emitted from the light source on the information recording medium;

a separation element for separating light from the information recording medium from an optical path to the light source;

first photodetectors for receiving light separated by the separation

element; and

second photodetectors,

wherein an aperture in a direction almost orthogonal to a track of data string on the information recording medium is formed so that an aperture NA1(R) in a first optical path from the light source to the information recording medium and an aperture NA2(R) in a second optical path from the information recording medium to the first photodetectors satisfy a relationship of NA1(R) > NA2(R), an aperture in a direction almost parallel to the track of data string on the information recording medium is formed so that an aperture NA1(T) in the first optical path and an aperture NA2(T) in the second optical path satisfy a relationship of NA1(T) = NA2(T), and at least a part of light outside the aperture NA2(R) in the second optical path is led to the second photodetectors.

51. The optical information processor according to claim 50,

wherein predetermined calculation is operated for respective outputs from the first photodetectors and the second photodetectors, and information on the information recording medium is reproduced based on results of the calculation.

52. The optical information processor according to claim 50,

wherein the first photodetectors and the second photodetectors are combined to form one component.

53. The optical information processor according to claim 50,

wherein the aperture in the second optical path is formed to be variable.

54. The optical information processor according to claim 50,

wherein the aperture in the second optical path is formed of an aperture element comprising a $\lambda/4$ plate and a liquid crystal element, and the optical information processor further comprises a driving circuit for the liquid crystal element.

55. The optical information processor according to claim 50,

wherein the aperture in the second optical path is formed of an aperture element provided with a liquid crystal element, the optical information processor further comprises a driving circuit for the liquid crystal element and a switching circuit for switching the driving circuit, and the aperture of the aperture element is varied by the switching circuit depending on the information recording medium.

56. An optical information processor performing at least either one of information recording and information reproduction with respect to an information recording medium, comprising:

a light source;

an objective lens for focusing light emitted from the light source on the information recording medium;

a separation element for separating light from the information recording medium from an optical path to the light source;

first photodetectors for receiving light separated by the separation element; and

second photodetectors,

wherein an aperture in a direction almost parallel to a track of data string on the information recording medium is formed so that an aperture NA1(T) in a first optical path from the light source to the information recording medium and an aperture NA2(T) in a second optical path from the information recording medium to the first photodetectors satisfy a relationship of NA1(T) > NA2(T), and an aperture in a direction almost orthogonal to the track of data string on the information recording medium is formed so that an aperture NA1(R) in the first optical path and an aperture NA2(R) in the second optical path satisfy a relationship of NA1(R) = NA2(R), and at least a part of light outside the aperture NA2(T) in the second optical path is led to the second photodetectors.

57. The optical information processor according to claim 56,

wherein predetermined calculation is operated for respective outputs from the first photodetectors and the second photodetectors, and information on the information recording medium is reproduced based on results of the calculation.

58. The optical information processor according to claim 56,

wherein the first photodetectors and the second photodetectors are combined to form one component.

59. The optical information processor according to claim 56,

wherein the aperture in the second optical path is formed to be variable.

60. The optical information processor according to claim 56,

wherein the aperture in the second optical path is formed of an aperture element comprising a $\lambda/4$ plate and a liquid crystal element, and

the optical information processor further comprises a driving circuit for the liquid crystal element.

61. The optical information processor according to claim 56, wherein the aperture in the second optical path is formed of an aperture element provided with a liquid crystal element, the optical information processor further comprises a driving circuit for the liquid crystal element and a switching circuit for switching the driving circuit, and the aperture of the aperture element is varied by the switching circuit depending on the information recording medium.

62. An optical information processor, comprising:

a light source;

an objective lens for focusing light from the light source on an information recording medium;

an aperture element positioned between the objective lens and the light source for setting an aperture of the objective lens;

an actuator for controlling position of the objective lens minutely; and

photodetectors detecting light reflected from the information recording medium,

wherein the aperture of the objective lens is varied in recording and in reproduction.

63. The optical information processor according to claim 62, wherein the aperture of the objective lens satisfies a relationship of D1 > D2, where D1 and D2 represent an aperture of the objective lens in recording and an aperture of the objective lens in reproduction respectively.

64. The optical information processor according to claim 62, wherein an aperture element formed of a polarization hologram comprising a 1/4 wave plate and a diffraction grating made of a birefringent material varies the aperture of the objective lens in recording and in reproduction.

65. The optical information processor according to claim 62, wherein an aperture element varies the aperture of the objective lens in recording and in reproduction and distributes light reflected by the information recording medium to the photodetectors.

66. The optical information processor according to claim 62, wherein the aperture of the objective lens is formed of an aperture

element comprising a polarization hologram portion and a thin film structure, the polarization hologram portion is formed by sandwiching a diffraction grating made of a birefringent material and a wave film having an optical thickness of (N + 1/4) $\lambda 1$ (wherein N indicates an arbitrary natural number) between two glass substrates, the thin film structure is attached to either one of the glass substrates and varies an aperture area respectively for two lights with wavelengths $\lambda 1$ and $\lambda 2$ ($\lambda 1 < \lambda 2$) passing through the aperture element.

67. The optical information processor according to claim 66,

wherein the other glass substrate, to which the thin film structure is not attached, of the two glass substrates (with a refractive index ng) is provided with a structure having a plurality of concentric stepped portions in which difference in height between adjacent stepped portions is $\lambda 1 / (ng - 1)$.

68. The optical information processor according to claim 66,

wherein the wavelengths $\lambda 1$ and $\lambda 2$ of two kinds of lights passing through the aperture element satisfy a relationship of $(N1 + 1/4)\,\lambda 1 \fallingdotseq N2 \times \lambda 2$, wherein N1 and N2 represent arbitrary natural numbers.

69. The optical information processor according to claim 62,

wherein the aperture of the objective lens is formed of an aperture element comprising a polarization hologram portion and a thin film structure, the polarization hologram portion is formed by sandwiching a diffraction grating made of a birefringent material and a wave film having an optical thickness of (N + 1/5) $\lambda 1$ (wherein N indicates an arbitrary natural number) between two glass substrates, the thin film structure is attached to either one of the glass substrates and varies an aperture area respectively for two lights with wavelengths $\lambda 1$ and $\lambda 2$ ($\lambda 1 < \lambda 2$) passing through the aperture element.

70. The optical information processor according to claim 69,

wherein the other glass substrate, to which the thin film structure is not attached, of the two glass substrates (with a refractive index ng) is provided with a structure having a plurality of concentric stepped portions in which difference in height between adjacent stepped portions is $\lambda 1 / (ng - 1)$.

71. The optical information processor according to claim 69,

wherein the wavelengths $\lambda 1$ and $\lambda 2$ of two kinds of lights passing through the aperture element satisfy a relationship of $(N1 + 1/5)\,\lambda 1 \fallingdotseq N2 \times \lambda 2$, wherein N1 and N2 represent arbitrary natural numbers.

72. An optical element transmitting a beam with a wavelength λ1 and a beam with a wavelength λ2 that is longer than the wavelength λ1, comprising:

a polarization hologram portion that is formed by sandwiching a diffraction grating made of a birefringent material and a wave film having an optical thickness of (N + 1/4) λ1 (wherein N indicates an arbitrary natural number) between two glass substrates; and

a thin film structure that is attached to either one of the glass substrates and varies an aperture area respectively for two lights with wavelengths λ1 and λ2 passing through the optical element.

73. The optical element according to claim 72,

wherein the other glass substrate, to which the thin film structure is not attached, of the two glass substrates (with a refractive index ng) is provided with a structure having a plurality of concentric stepped portions in which difference in height between adjacent stepped portions is λ1 / (ng – 1).

74. The optical element according to claim 72,

wherein the wavelengths λ1 and λ2 of two kinds of lights passing through the optical element satisfy a relationship of (N1 + 1/4) λ1 ≒ N2 × λ2, wherein N1 and N2 represent arbitrary natural numbers.

75. An optical element transmitting a beam with a wavelength λ1 and a beam with a wavelength λ2 that is longer than the wavelength λ1, comprising:

a polarization hologram portion that is formed by sandwiching a diffraction grating made of a birefringent material and a wave film having an optical thickness of (N + 1/5) λ1 (wherein N indicates an arbitrary natural number) between two glass substrates; and

a thin film structure that is attached to either one of the glass substrates and varies an aperture area respectively for two lights with wavelengths λ1 and λ2 passing through the optical element.

76. The optical element according to claim 75,

wherein the other glass substrate, to which the thin film structure is not attached, of the two glass substrates (with a refractive index ng) is provided with a structure having a plurality of concentric stepped portions in which difference in height between adjacent stepped portions is λ1 / (ng – 1).

77. The optical element according to claim 75,

wherein the wavelengths λ1 and λ2 of two kinds of lights passing

through the optical element satisfy a relationship of $(N1 + 1/5)\,\lambda 1 \fallingdotseq N2 \times \lambda 2$, wherein N1 and N2 represent arbitrary natural numbers.